

Claims

- [c1] 1. An RF coil assembly, comprising:
 - an RF coil, and
 - a means for cooling the RF coil.
- [c2] 2. The RF coil assembly of claim 1 wherein the means for cooling comprises:
 - an outer cylinder,
 - an inner cylinder concentric with the outer cylinder, and
 - a plurality of longitudinal spacers between the inner and outer cylinders, said spacers being arranged in such a manner so as to form coolant channels therebetween.
- [c3] 3. The RF coil assembly of claim 2 wherein the means for cooling comprises:
 - a plurality of helical spacers between the inner and outer cylinders, said helical spacers being arranged in such a manner so as to form continuous cooling channels therebetween.
- [c4] 4. The RF coil assembly of claim 1 wherein the means for cooling comprises:
 - a patient bore enclosure, and
 - a plurality of longitudinal cooling tubes attached to ex-

terior of the patient bore enclosure.

- [c5] 5. The RF coil assembly of claim 1 wherein the means for cooling comprises:
 - a patient bore enclosure, and
 - a continuous cooling tube attached to the patient bore enclosure, said cooling tube being wound in the general shape of a helix.
- [c6] 6. The RF coil assembly of claim 1 wherein the means for cooling comprises:
 - a plurality of longitudinal cooling channels, said cooling channels being embedded within the RF coil.
- [c7] 7. A patient bore cooling assembly for an RF coil in a cylindrical MR imaging system, comprising:
 - a generally cylindrical RF coil having an inner surface, and
 - a plurality of cooling channels attached to the RF coil.
- [c8] 8. The patient bore cooling assembly of claim 7 wherein the plurality of cooling channels further comprises:
 - an outer cylinder attached to the inner surface of the RF coil,
 - an inner cylinder concentric with the outer cylinder, and
 - a plurality of longitudinal spacers extending radially outwardly from the inner cylinder and attached to the outer

cylinder.

- [c9] 9. The patient bore cooling assembly of claim 7 wherein the plurality of cooling channels further comprises an outer cylinder, an inner cylinder concentric with the outer cylinder, and a continuous helical spacer extending radially outwardly from the inner cylinder and attached to the outer cylinder.
- [c10] 10. The patient bore cooling assembly of claim 7 wherein the plurality of cooling channels further comprises a generally cylindrical patient bore tube attached to the inner surface of the RF coil, and a plurality of longitudinal cooling tubes attached to the patient bore tube.
- [c11] 11. The patient bore cooling assembly of claim 7 wherein the plurality of cooling channels further comprises a generally cylindrical patient bore tube attached to the inside of the RF coil, and a cooling tube attached around the patient bore tube in a generally helical configuration.
- [c12] 12. The patient bore cooling assembly of claim 7

wherein the plurality of cooling channels further comprises a plurality of longitudinal cooling channels embedded within the RF coil.

- [c13] 13. The patient bore cooling assembly of claim 7 wherein the plurality of cooling channels further comprises a helical cooling channel embedded within the RF coil.
- [c14] 14. A patient bore cooling assembly for an RF coil used in a cylindrical MR imaging system comprising:
 - a gradient coil winding of hollow cylindrical configuration,
 - a hollow cylindrical RF coil concentric with and slightly smaller than the gradient coil,
 - an outer cylinder attached to the RF coil,
 - an inner cylinder concentric with the outer cylinder, and
 - a plurality of spacers protruding radially outwardly from the inner cylinder and attached to the outer cylinder forming cooling channels between said inner and outer concentric cylinders.
- [c15] 15. The patient bore cooling assembly of claim 14 wherein the cylinder has an axis and said spacers are arranged longitudinally along the axis of the cylinder.
- [c16] 16. The patient bore cooling assembly of claim 14

wherein said spacers are positioned helically around the inner cylinder.

- [c17] 17. A patient bore cooling assembly for an RF coil in a cylindrical MR system comprising:
 - a gradient coil winding of hollow cylindrical configuration,
 - an RF coil of hollow cylindrical configuration inside the gradient coil winding,
 - a generally cylindrical patient bore inside of the RF coil having an inside surface and an outside surface, and
 - a plurality of longitudinally spaced cooling tubes attached to the outside surface of the patient bore.
- [c18] 18. The patient bore cooling assembly of claim 17 further comprising:
 - a plurality of connecting tubes,
 - an intake manifold directing coolant from a connecting tube to the longitudinal tubes,
 - an exhaust manifold collecting coolant from the longitudinal tubes to a connecting tube,
 - a pump moving fluid through the circulatory connecting tubes, and
 - a heat exchanger cooling the fluid in the connecting tubes.
- [c19] 19. A patient bore cooling assembly for an RF coil in a

cylindrical MR system comprising:
a gradient coil winding of hollow cylindrical configuration,
an RF coil of hollow cylindrical configuration inside the gradient coil winding,
a generally cylindrical patient bore inside of the RF coil having an inside surface and an outside surface, and
a cooling tube in a helical configuration attached to the outside surface of the patient bore.

- [c20] 20. The patient bore cooling assembly of claim 19 further comprising:
a plurality of connecting tubes,
a pump moving fluid though the circulatory connecting tubes, and
a heat exchanger cooling the fluid in the connecting tubes.
- [c21] 21. The patient bore cooling assembly of claim 20 further comprising:
a plurality of temperature sensors located within the patient bore assembly,
a computer electronically linked to said coolant pump and to said temperature sensors, said computer being programmed to increase coolant flow in the event of a rise in patient bore temperature and to decrease coolant flow in the event of a drop in coolant temperature.

- [c22] 22. A patient bore cooling assembly for an RF coil in a cylindrical MR system comprising a plurality of longitudinal cooling channels, said cooling channels being embedded within the cylindrical RF coil itself.
- [c23] 23. The patient bore cooling assembly of claim 22 further comprising:
 - a plurality of connecting tubes,
 - an intake manifold directing coolant from a connecting tube to the longitudinal tubes,
 - an exhaust manifold collecting coolant from the longitudinal tubes to a connecting tube,
 - a pump moving fluid through the circulatory connecting tubes, and
 - a heat exchanger cooling the fluid in the connecting tubes.
- [c24] 24. In an open architecture MR imaging system, an RF coil assembly, comprising:
 - an RF coil, and
 - a patient bore enclosure, and
 - a plurality of cooling tubes attached to the patient bore enclosure.
- [c25] 25. The open architecture MR imaging system of claim 24 wherein a plurality of cooling tubes are embedded within

the RF coil.